INFORMATION SHEET

ORDER NO. R5-2008-____
NORCAL WASTE SYSTEM HAY ROAD LANDFILL, INCORPORATED
HAY ROAD LANDFILL
SOLANO COUNTY

Background

The Norcal Waste System Hay Road Landfill is a Class II municipal solid waste landfill facility about eight miles east of Vacaville in Solano County. The landfill has been in operation since 1968 serving the incorporated and unincorporated areas of Solano County. The facility accepts nonhazardous and designated waste, including MSW to Class II and Class III waste management units at the landfill. These wastes include construction and demolition debris, household, commercial and industrial wastes, de-watered wastewater treatment plant sludge, industrial sludges, treated wood waste, dredge debris, slab/construction/demolition debris, commercial/industrial waste, glass cullet, asbestos containing waste, and other non-hazardous or designated wastes.

Existing Facilities and Expansion Area

The facility consists of three landfill units. Landfill 1 (LF-1) is an older partially lined Class III unit that consists of module DM-1; Landfill 2 (LF-2) is a lined Class III unit that consists of module DM-2.1, and Landfill 3 (LF-3) is a Class II expansion unit approved by the Regional Water Board in 1995 consisting of several modules. LF-3, the expansion landfill will ultimately consist of 15 Class II modules. LF-3 currently consists of four Class II modules DM-2.2, DM-4, DM-5, and DM-11. The facility also includes a Class II waste pile (WP-9.1), and a Class II land treatment unit (LTU).

Waste Pile and Land Treatment Unit for Sludge

Waste pile WP-9.1 is used to contain de-watered wastewater treatment plant sludge accepted by the facility during the wet season, and the LTU is used to dry the sludge in during the dry season. After it is dry, the sludge is removed from the LTU area and used as alternative daily cover (ADC) in landfill modules. Dried sludge is also used in soil manufacturing operations conducted in the LTU area. WDRs Order No. 5-01-101 re-classified former landfill module DM-9.1 as a Class II waste pile (now WP-9.1) under Title 27, and prescribe requirements for sludge storage in the unit and closure. The WDRs also classified the sludge drying area as a Class II LTU and prescribed requirements for that discharge, including a requirement that all sludge be removed from the LTU prior to the wet season.

Alternative Daily Cover

The Discharger uses various non-hazardous and designated wastes accepted at the landfill as alternative daily cover (ADC) on landfill modules, including wood, green waste, compost materials, biosolids, sludge, ash, cement kiln dust, dredge spoils, shredded tires, processed construction and demolition debris, and contaminated soil. These WDRs include a discharge specification requiring that, for each type of waste, the Discharger first demonstrate that it does not pose a threat to water quality and meets the requirements for use as ADC under Title 27 CCR Section 20705.

Soil Manufacturing

It is estimated that there will be about a 3.7 million cubic yard deficit in the amount of soil needed for future module construction activities and operations and the available onsite supply from the borrow pit (estimated to be about 5.8 million cubic yards). The Discharger plans to make up the difference by importing soil and ADC, and from soil manufacturing operations. The soil manufacturing operations involve the mixing of borrow soil, sludge and other waste materials, so as to create a soil-type product suitable for cover and construction applications.

The soil manufacturing operations is conducted during the dry season within the LTU area. The manufactured soil generally consists of a mixture of dried sludge (60%), compost overs (oversized material screened from compost) (20%), and onsite soil (20%), or alternatively only dried sludge (70%) and soil (30%). Once mixed, the manufactured soil is stockpiled next to the module where it is needed for construction operations. For modules not scheduled for construction that year, the stockpiles are winterized prior to the wet season by grading and capping them (with a one-foot layer of clay) for drainage and erosion control. The JTD states that the manufactured soil is used for operations layer soil. The WDRs require that any manufactured soil used in module construction meet the desired specifications and performance standard for that application as demonstrated in a staff-approved design report. The WDRs also require that any stockpiles from soil manufacturing operations are adequately winterized to protect water quality.

Liner Performance Demonstration

The Discharger submitted a *Liner Performance Demonstration Report for DM-4.1 and Future Class II Liner Systems* dated 15 April 2003. The Disposal Module 4.1 (DM-4.1) base liner for Hay Road Landfill was proposed as follows (from bottom to top):

- Compacted subgrade comprised of fined-grained soils;
- 60-mil high density polyethylene (HDPE) geomembrane liner;
- Leak detection geocomposite;
- 2.5-foot thick compacted clay liner with a permeability of 1×10^{-7} cm/s or less;
- 60-mil HDPE geomembrane;
- Leachate collection and removal system (LCRS) gravel layer at least 6 inches thick;
- 8-oz. Geotextile filter layer; and
- 12-inch thick operations layer.

The side-slope liner system was proposed as follows (from bottom to top):

- Compacted subgrade comprised of fined-grained soils;
- Geosynthetic clay liner (GCL) with 30-mil geomembrane;
- 60-mil HDPE geomembrane;
- LCRS geocomposite; and
- 1.5-foot minimum operations layer.

The Discharger will provide comprehensive construction quality control during the liner system construction, complete an electrical leak location survey to verify the integrity of the primary liner system, and install landfill gas (LFG) collection pipes within the LCRS to control LFG in the future, if necessary.

The demonstration compared efficiencies and leakage potential of six different liner system designs. A total leakage potential of 1.04 gallons was calculated throughout the life of the landfill (operations and 30-year post-closure period) for the 14-acre (DM-4) cell. In addition, a cost-benefit analysis was performed which showed that additional liner components would cost significantly more without significantly less leakage potential. As such, the demonstration concluded that a more stringent liner system is not warranted since the proposed system will meet the performance requirements of Title 27 CCR because it exemplifies the prescriptive standard with an additional leak detection component.

Closure

During 2007, the Discharger submitted an updated *Preliminary Closure and Post-Closure Maintenance Plan* (PCPMP) for the facility. Under the plan, all three landfills will be closed contiguously as a single closed facility. Final cover will be installed as portions of the landfills reach final refuse grade. The crest elevation for the closed facility, including final cover, will be about 215 feet MSL compared to the base elevation of about 30 feet MSL. The final cover side slopes will have a maximum slope of 4:1 (horizontal-to-vertical), with 25-foot wide benches for every 50 vertical feet. The crest will have a minimum slope of five percent to ensure adequate drainage and control erosion.

The Discharger proposes an engineered alternative design (EAD) for the final cover, previously approved in WDRs R5-2003-0118, as follows:

For the top deck areas of the landfill consisting of (from top to bottom):

- A one-foot thick vegetative soil layer;
- A protective 10-oz/y geotextile cushion layer;
- A 60-mil HDPE geomembrane
- A low-permeability GCL; and
- A one-foot thick compacted soil foundation layer.

The side slope design includes (from top to bottom):

- A one-foot thick vegetative soil layer;
- A geocomposite drainage layer;
- A 60-mil HDPE geomembrane (textured on both sides); and
- A one-foot thick compacted soil foundation layer.

The Discharger made the demonstration that the EAD will provide equal or better performance than the prescriptive standard. The Discharger showed that the geosynthetic materials proposed can tolerate substantially higher strains up to 10 to 20 percent or greater before yielding and can tolerate strains 10 times larger than its soil components. As such, a

two-foot thick foundation is not necessary for geosynthetic materials and that a one-foot thick foundation layer is adequate to provide a clean, firm surface for its installation. In addition, the Discharger provided a hydraulic equivalency evaluation for the system using GCL that showed significantly improved infiltration performance over the previously approved 1993 EAD cover system, and provided equal or improved performance to the prescriptive cover system.

Groundwater Monitoring

The depth to groundwater varies from about 2 to 23 feet below ground surface (bgs), averaging about 10 feet bgs or 10 feet above mean sea level (MSL). The regional ground water flow direction is from northwest to southeast, but is altered over much of the site by groundwater pumping from the borrow pit. As a result, the shallow groundwater gradient direction over the western half of the site, including DMs-1, 2.2, 2.1 and 11 is to the south or southwest toward the borrow pit, while that on the eastern half of the site conforms more to the regional gradient direction.

The groundwater pumping appears to be causing groundwater to be drawn beneath the units on the western portion of the site. As such, detection monitoring using an interwell approach would not likely be effective in detecting a release of leachate from these units. The Discharger monitors the western portion of the site, including modules DM-1, DM-2.2, DM-2.1 and DM-11, using the method of “intrawell” comparisons. The eastern portion of the site is monitored using an interwell approach with background wells installed along the northern periphery of the landfill and detection wells installed immediately downgradient of each landfill module.

Evaluation Monitoring and Corrective Action for DM-11

The Discharger conducted an evaluation monitoring program (EMP) at DM-11 to investigate the nature and extent of VOC-impacts from two apparent release events, which were detected in October 1999 and April 2000, respectively. Liquid was detected in the two pan lysimeters that monitor the LCRS sumps at DM-11. Approximately 4,755 gallons of liquid was pumped from PL-11.1, and 16,850 gallons was pumped from PL-11.2 through early August 2000 as a result of the second release. Additional liquid was detected in PL-11.2 in late October 2000, but PL-11.1 has been dry since early August 2000. Confirmation analysis of the liquid indicated the presence of volatile organic compounds (VOCs), including Acetone (up to 585 µg/l), 2-Butanone (up to 1,500 µg/l), Chloroethane (up to 4.2 µg/l), 1,1-Dichloroethane (up to 6.8 µg/l), Methylene chloride (up to 60.1 µg/l), 1,1,1-Trichloroethane (up to 2.6 µg/l), and Trichlorofluoromethane (up to 8.2 µg/l).

An *Engineering Feasibility Study* (EFS) for DM-11.1 and DM-11.2, dated 30 May 2001, was submitted in accordance with Title 27 CCR Section 20420(k)(6), which includes the results of the EMP. The extent of impact was evaluated through an investigation, which included soil, soil gas, and groundwater sampling near and downgradient of the disposal modules. Based on the investigation, several potential sources for the water and VOCs were evaluated. The EFS concluded that the VOCs detected in the liquid was likely due to the surface water coming into contact with VOCs on the active landfill ground surface before entering the

gravel capillary break layer and possibly LFG. The corrective action measures implemented included covering the capillary break gravel layer during the rainy season and preventing surface water runoff from entering the gravel layer using improved surface runoff controls. On 21 March 2003, the Discharger submitted a LFG monitoring and corrective action alternatives for DM-11. To better define the occurrence and potential for gas migration, the Discharger proposed to install and monitor seven new LFG probes (GP-2 through GP-8) and monitor one existing probe (GP-1) for concentrations of combustible gas (as methane), oxygen, carbon dioxide, and barometric pressure. The monitoring intervals will target fine sand layers that underlie the site. Each pan lysimeter will also be monitored (PL-2.2A, PL-2.2B, PL-5.1A, PL-5.1B, PL-11.1 and PL-11.2).

The Discharger submitted a corrective action plan for DM-11.1 and DM-11.2 in May 2005 that was approved during August 2005. The plan consisted of installing additional probes along the perimeter to provide additional for the design of an in-fill landfill gas control system. A limited number of landfill gas extraction wells have been installed in DM-1, DM-2.1, DM-2.2, and DM-11 for passive venting; however, installation of the full system has not yet been completed due to delays in the permitting process with the local air district. The full system will consist of a landfill gas venting system and flare connected to nine new landfill gas wells, the existing landfill gas wells, and nine leachate sump risers. Startup of the full system is expected during the fall of 2008 following the completion of permitting with the local air district.

The monitoring program in the WDRs incorporates the EFS, including more frequent (weekly) monitoring of the pan lysimeters for liquid at DM-11 and other modules in corrective action, LFG monitoring, and other activities.

Evaluation Monitoring and Corrective Action for WP-9.1

During routine monitoring in July 2000, liquid was detected in pan lysimeters PL-9.1A and PL-9.1B located beneath WP-9.1. Grab water samples were obtained from both pan lysimeters and elevated concentrations of nitrate were detected (395 milligrams per liter (mg/L) in PL-9.1A and 153 mg/L in PL-9.1B). Liquid from each pan lysimeter was sampled during fourth quarter 2000, first quarter 2001, and second quarter 2001. Analytical results from these samples confirmed the presence of high concentrations of nitrate/nitrite as nitrogen.

The Discharger submitted an *Amendment to Report of Waste Discharge and Establishment of Evaluation Monitoring Program for Pan Lysimeters PL-9.1A and PL-9.1B* (EMP), dated 7 June 2001. The EMP concluded that a leak in the liner of WP-9.1 may have allowed leachate to enter the capillary break layer and/or the pan lysimeters. Approximately 3,200 gallons of liquid was removed from PL-9.1A and 3,700 gallons from PL-9.1B. The EMP includes the installation of two new downgradient groundwater monitoring wells, G-19 (southern side) and G-21 (eastern side) and daily monitoring of liquid levels in both pan lysimeters. Additional investigation was proposed which included a review of the landfill module design, construction, and operations and maintenance records as well as conducting an electrical leak location survey to locate liner leaks.

An EFS was submitted by the Discharger in November 2001 describing the results of the June 2001 EMP to define the nature of the release. Evaluation monitoring confirmed

degradation in new monitoring well G-21 with concentrations of nitrate of 30 mg/L and 22 mg/L in June and July 2001, respectively. A leak was detected using electrical leak location survey on the eastern half of WP-9.1. The hole measured approximately 4 inches by 6 inches and was repaired. Corrective action measures included repair of the liner leak and covering he exposed edges of the landfill module liner system with plastic sheeting to reduce the possibility of surface water from entering the capillary break layer.

Work was performed during April 2002 to further investigate the nature and extent of the release to the unsaturated zone and groundwater, and was reported in the EFS dated 9 May 2002. Soil samples were obtained below the landfill capillary break layer and in the soils surrounding WP-9.1 to investigate an overflow of leachate out of the module which likely occurred when leachate levels in the sumps exceeded the elevation of the WP-9.1 liner along the northeast and northwest perimeters. Soil analytical results indicated that leachate impacted the soil at and adjacent to an area of erosion observed near the northeast corner of WP-9.1. In response, the Discharger installed new pumps, larger leachate storage tanks, and improved off-site leachate disposal capabilities. Grab groundwater samples were also obtained downgradient of well G-21, and adjacent to the northeast corner of WP-9.1. The grab groundwater analytical results indicated that the nitrate/nitrite as nitrogen concentrations in downgradient groundwater are lower than in well G-21, but are above background concentrations.

On 14 November 2002 and 15 January 2003, the Discharger submitted a revised EFS and addendum, respectively, which presents the results of additional soil and groundwater sampling to complete the definition of the extent of soil and groundwater impacts in the area of WP-9.1. Soil samples were obtained below the landfill capillary break layer and in the soils surrounding the unit. Soil analytical results indicated that leachate had impacted the soil at and adjacent to an area of erosion observed near the northeast corner and in soils at the northwest corner of the unit. Interim corrective action was taken in October 2002, resulting in the excavation of approximately 1,500 cubic yards of nitrate-impacted soil, which was approved by the Regional Water Board staff on 23 September 2002, and lining the module containment berms to seal off the LCRS layer and prevent future overflow of leachate from the module.

Grab groundwater samples were also obtained downgradient of well G-21 and adjacent to the northeast corner of the unit. The grab groundwater analytical results indicated that the area of nitrate impact to groundwater is limited to the area immediately surrounding and approximately 150 feet downgradient of G-21. Corrective action measure included installing a new groundwater extraction well (G-22) that was installed approximately 10 feet downgradient of G-21 and screened across the entire depth-interval of the poorly-graded sand layer. The water would then be re-used as dust control for lined landfill modules or trucked and disposed of at the sewage treatment plant. To address the effectiveness of the groundwater extraction on the next deeper sand layer, a new groundwater monitoring well (G-23) was installed adjacent to well G-21. To address the effectiveness of groundwater extraction near the downgradient limit, one new monitoring well (G-24) was installed approximately 200 feet downgradient of well G-21. Monitoring wells G-21, G-23, G-24 and extraction well G-22 will be sampled quarterly and analyzed for depth to water, turbidity, pH, specific conductance, and nitrate-nitrite as nitrogen as part of corrective action monitoring program. G-21 is also monitored semi-annually for the routine detection monitoring

parameters. The nitrate concentrations in wells G-21 and G-22 have decreased significantly since groundwater extraction was implemented (G21: 26 mg/L decreasing to 11 mg/L and G-22: 37 mg/L decreasing to 3.2 mg/L). During 2007, approximately 312,000 gallons of impacted groundwater were pumped from G-22 and stored for dust control on lined modules. The average flow rate is approximately 0.6 gallons per minute, which is close to the design extraction rate.

The monitoring program in the WDRs incorporates the EFS and corrective action measures, including more frequent (weekly) monitoring of the pan lysimeters at WP-9.1 for liquid (or after rainfall of greater than one inch); sampling of any liquid; removal of any liquid detected in the pan lysimeters; groundwater extraction as a corrective action measure; additional groundwater monitoring wells to monitor the release; and other activities.

Leachate and Condensate Management

As part of the amended RWD/JTD submitted on 8 April 2008, the Discharger requested to be allowed to return leachate and landfill gas condensate to the units from which they came to reduce leachate and condensate management costs. These units are DM-4, DM-5, and DM-11. Title 27 CCR 20340(g) requires that leachate be returned to the unit from which it came or be discharged in a manner approved by the Regional Water Board. This section also references State Water Board Resolution No. 93-62 regarding liquids restrictions in 40CFR 258.28 for MSW landfills. 40CFR 258.28 states that liquid waste may not be placed in MSW landfill units unless the waste is leachate or gas condensate derived from the landfill unit and it is designed with a composite liner and leachate collection system. Therefore, leachate and landfill gas condensate from composite lined units at the landfill may be returned to the unit from which they came. This Order includes requirements for returning leachate and landfill gas condensate back to the units such that it is not exposed to surface water runoff, will not cause instability of the landfill, and will not seep from the edges of the units.

Surface Water Drainage

The site is in the Putah plain, which is drained by natural and man-made watercourses. The nearest surface water is the Alamo Creek A-1 Channel, an agricultural drainage canal which flows by the north and east sides of the site. The A-1 Channel drains to Ulatis Creek about three miles southeast of the site, then to Cache Slough and the Sacramento-San Joaquin Delta. Alamo Creek formerly ran through the site but in the 1960s was diverted northeast of the site to Ulatis Creek. There is also a pond in the southeast corner of the site, referred to as “the bird sanctuary”, which collects site storm water flows and groundwater pumped from the borrow pit.

WLB